

Work Order ID 72815

Tuesday, August 16, 2011 8:01:09 AM



U/R

Page 1

Item ID: D350-748-141TRN

Accept



Setup Start



Revision ID: U/R

Stop



Item Name: Crosstube Turning Detail

Start Date: 8/16/2011 Start Qty: 1.00



Cust Item ID:

Required Date: 8/22/2011 Req'd Qty: 1.00

Customer:

Reference:

Approvals: Process Plan:

Date: 11-08-14 Tooling:

Date:

Run Start



QC:

Date: SPC (Y/N):

Date:

Stop



| Sequence ID/ Work Center ID | Operation Description | Set Up/ Run Hours | Tool ID | Tool # | Plan Code | Accept Qty | Reject Qty | Reject Number | Insp. Stamp |
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|

Draw Nbr

Revision Nbr

D350-748-141-

F U/R OK QP 11.08.14

100

0.00



MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Fill tube with sand & install plugs on both ends as per Folio FA648
2-Turn first side as per Folio FA648
3- File transition lines smooth.

1 Ø
mm.L 11/08/18

110

0.00



QC1- Inspect dimensions to dimension sheet

QC

Memo

0.00

Quality Control

1 Ø
mm.L 11/08/18

120

0.00



MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Turn second side as per Folio FA648
2- File transition lines smooth.
3-Scribe Part & Batch as per Dwg D350-748-141

1 Ø
mm.L 11/08/18

| W/O: | | WORK ORDER CHANGES | | | | | |
|------|------|--------------------|----|------|-----|-------------------------------------|--------------------------|
| DATE | STEP | PROCEDURE CHANGE | By | Date | Qty | Approval Chief Eng / Prod Mgr | Approval QC Inspector |
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Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

| NCR: | | WORK ORDER NON-CONFORMANCE (NCR) | | | | | | |
|------|------|----------------------------------|-----------------------------|---------------------------------|----------------|---------------------------|-----------------------|--------------------------|
| DATE | STEP | Description of NC Section A | Corrective Action Section B | | | Verification Section C | Approval Chief Eng | Approval QC Inspector |
| | | | Initial Chief Eng | Action Description Chief Eng | Sign & Date | | | |
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NOTE: Date & initial all entries

Work Order ID 72815

Tuesday, August 16, 2011 8:01:09 AM

Page 2

Item ID: D350-748-141TRN

Accept

Revision ID: U/R

Item Name: Crosstube Turning Detail

Start Date: 8/16/2011 Start Qty: 1.00

Required Date: 8/22/2011 Req'd Qty: 1.00




Reference:

Cust Item ID:

Customer:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____
QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Run Start
Stop

| Sequence ID/ Work Center ID | Operation Description | Set Up/ Run Hours | Tool ID | Tool # | Plan Code | Accept Qty | Reject Qty | Reject Number | Insp. Stamp |
|--|--|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|
| 130  QC Quality Control | QC1- Inspect dimensions to dimension sheet Memo | 0.00 0.00 | | | | 1 | 0 | | mm.v 11/08/18 |
| 140  QC Quality Control | QC8- Inspect parts - second check Memo | 0.00 0.00 | | | | 1 | 0 | | B.A 11/08/22 |
| 150  Crosstubes Crosstubes | Large Fab Memo Grind machining marks | 0.00 0.00 | | | | | | | SAD 11-08-24 |

| W/O: | | WORK ORDER CHANGES | | | | | |
|------|------|--------------------|----|------|-----|-------------------------------------|--------------------------|
| DATE | STEP | PROCEDURE CHANGE | By | Date | Qty | Approval Chief Eng / Prod Mgr | Approval QC Inspector |
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Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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| | | | Initial Chief Eng | Action Description Chief Eng | Sign & Date | | | |
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NOTE: Date & initial all entries

1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

2. Once the problem is identified, the next step is to define the objectives and goals of the project. This helps to clarify what needs to be achieved and provides a clear direction for the work.

3. The third step is to develop a plan or strategy to address the problem. This involves breaking down the problem into smaller, manageable tasks and determining the resources needed to complete them.

4. The fourth step is to implement the plan. This involves putting the strategy into action and monitoring progress to ensure that the objectives are being met.

5. The final step is to evaluate the results of the project. This involves assessing the outcomes against the objectives and identifying any areas for improvement or further action.

Page 3

Accept

**Setup Start**

Stop

10/11

Cust Item ID:[illegible]

Customer:

Reference:

Run Start

Stop

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Operation Description

Set Up/ Run Hours

Tool ID

Tool #

Plan Code

**Accept
Qty**

Reject
QtyReject
Number

**Insp.
Stamp**

Outsource process - Heat Treat

0.00

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Outsource1

Memo

0.00

Outsource process - Heat Treat

Issue P/O: 14727
Heat Treat to min 180 KSI As per Dwg D350-748-141
(MIL-T-6736 OR AMS 2759-1C)
Sand Blast tube after Heat Treat
Possible Supplier: Vac Aero
Ensure Certificate of Conformity is attached

170

Receive & Inspect for Damage & Mat'l Certs

0.00

[illegible]

Packaging

Memo

0.00

Packaging

Ensure certificate of conformaty is attached

180

QC6- Inspect dimensions to drawing

0.00

[illegible]

QC

Memo

0.00

Quality Control

| W/O: | | WORK ORDER CHANGES | | | | | |
|------|------|--------------------|----|------|-----|-------------------------------------|--------------------------|
| DATE | STEP | PROCEDURE CHANGE | By | Date | Qty | Approval Chief Eng / Prod Mgr | Approval QC Inspector |
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NOTE: Date & initial all entries

Work Order ID 72815

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Page 4

Item ID: D350-748-141TRN

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Setup Start



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Stop



Item Name: Crosstube Turning Detail

Start Date: 8/16/2011 Start Qty: 1.00



Cust Item ID:

Required Date: 8/22/2011 Req'd Qty: 1.00



Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Run Start



Stop



| Sequence ID/ Work Center ID | Operation Description | Set Up/ Run Hours | Tool ID | Tool # | Plan Code | Accept Qty | Reject Qty | Reject Number | Insp. Stamp |
|--------------------------------|---|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|
| 190 | | 0.00 | | | | | | | |
| | Packaging | | | | | | | | |
| Packaging | Memo | 0.00 | | | | | | | |
| Packaging | Identify and stock in kanban rack Location: <u>Back Hall</u> | | | | | | | | |
| | | | | | | | | | |
| 200 | QC21- Final Inspection - Work Order Release | 0.00 | | | | | | | |
| | | | | | | | | | |
| QC | Memo | 0.00 | | | | | | | |
| Quality Control | | | | | | | | | |

manic 11/09/26

11/9/27

MF 11-09-27

| W/O: | | WORK ORDER CHANGES | | | | | |
|------|------|--------------------|----|------|-----|-------------------------------------|--------------------------|
| DATE | STEP | PROCEDURE CHANGE | By | Date | Qty | Approval Chief Eng / Prod Mgr | Approval QC Inspector |
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NOTE: Date & initial all entries

Picklist Print

Tuesday, August 16, 2011 8:01:15 AM

Page 1

Work Order ID: 72815



Parent Item: D350-748-141TRN



Parent Item Name: Crosstube Turning Detail



Start Date: 8/16/2011

Required Date: 8/22/2011

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:A New Issue 08-03-06 DD verified by:ec
IPP Rev B Removed polish 08.04.02 EC verified by : DD
IPP Rev C Remove LPS-3 08.06.23 EC verified by DD IPP Rev C
11.02.24 as per dwg rev.F DD verf: JLM

| Component Item ID/ Item Name | Replacement Item ID | Mfg/ Purch | Bin Item | Primary Location | Last Location | Route Seq ID | Unit of Measure | Qty on Hand | Qty per Kit | Total Qty | Qty Issued | Date Issued | Status |
|---|------------------------|---------------|-------------|---------------------|------------------|-----------------|--------------------|----------------|---|--------------|---------------|----------------|--------|
| D6015-125  | | Manufactured | No | | | 110 | Each | 30.0000 | 1 | 1 | | | |
| Crosstube Material | | | | | | | | |  | | | | |

Location

Loc Qty

Loc Code

HALL

30

61380

30

— 1 — amm.L 11/08/18

| W/O: | | WORK ORDER CHANGES | | | | | |
|------|------|--------------------|----|------|-----|-------------------------------------|--------------------------|
| DATE | STEP | PROCEDURE CHANGE | By | Date | Qty | Approval Chief Eng / Prod Mgr | Approval QC Inspector |
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Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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NOTE: Date & initial all entries

| | | |
|---|--|----------------------------------|
| DART AEROSPACE LTD | | Work Order: 72815 |
| Description: Crosstube Assembly (AS350/355 High Fwd) | | Part Number: D350-748-141 |
| Inspection Dwg: D350-748-141 Rev: F | | Page 1 of 1 |

FIRST ARTICLE INSPECTION CHECKLIST

| | Inspection Sheet Drawing Dimension | Tolerance | Actual Dimension | Accept | Reject | Method of Inspection | Comments |
|--------|---------------------------------------|---------------|---------------------|--------|--------|-------------------------|----------|
| SIDE A | 2.240 | +0.005/-0.000 | 2.244 | ✓ | | Misc | CNC-04 |
| | 2.180 | +0.005/-0.000 | 2.184 | ✓ | | " | |
| | 2.180 | +0.005/-0.000 | 2.185 | ✓ | | " | |
| | 2.237 | +0.005/-0.000 | 2.241 | ✓ | | " | |
| | 2.272 | +0.005/-0.000 | 2.275 | ✓ | | " | |
| | 2.306 | +0.005/-0.000 | 2.308 | ✓ | | " | |
| | 2.339 | +0.007/-0.000 | 2.341 | ✓ | | " | |
| | 2.339 | +0.007/-0.000 | 2.346 | ✓ | | " | |
| | 0.062 | +/-0.010 | .062 | ✓ | | vern | JF-01 |
| | 4.26 | +/-0.030 | 4.250 | ✓ | | " | |
| | R0.063 | +/-0.010 | .063 | ✓ | | RG | |
| | R0.50 | +/-0.030 | .50 | ✓ | | " | |
| | | | | | | | |
| | | | | | | | |
| SIDE B | 2.240 | +0.005/-0.000 | 2.245 | ✓ | | Misc | CNC-04 |
| | 2.180 | +0.005/-0.000 | 2.185 | ✓ | | " | |
| | 2.180 | +0.005/-0.000 | 2.185 | ✓ | | " | |
| | 2.237 | +0.005/-0.000 | 2.242 | ✓ | | " | |
| | 2.272 | +0.005/-0.000 | 2.275 | ✓ | | " | |
| | 2.306 | +0.005/-0.000 | 2.309 | ✓ | | " | |
| | 2.339 | +0.007/-0.000 | 2.341 | ✓ | | " | |
| | 2.339 | +0.007/-0.000 | 2.346 | ✓ | | " | |
| | 0.062 | +/-0.010 | .062 | ✓ | | vern | JF-01 |
| | 4.26 | +/-0.030 | 4.26 | ✓ | | " | |
| | R0.063 | +/-0.010 | .063 | ✓ | | RG | |
| | R0.50 | +/-0.030 | .50 | ✓ | | " | |
| | | | | | | | |
| | | | | | | | |
| | 110.27 | +/-0.060 | 110.26 | ✓ | | tape | mmr-02 |

| | | |
|-------------------------|------------------------|------------------------------|
| Measured by: MMV | Audited by: B.A | Preliminary Approval: |
| Date: 11/08/14 | Date: 11/08/22 | Date: |

| Rev | Date | Change | Revised by | Approved |
|-----|----------|--|------------|----------|
| A | 06.11.09 | New Issue (P/O D350-748-101) | KJ/JLM | |
| B | 07.10.24 | Dwg Rev updated | KJ/EC/DD | |
| C | 11.01.20 | Dwg Rev updated | KJ | |
| D | 11.07.26 | Tolerance revised for 2.339 dimensions | KJ | |

| Item | Qty | Part Number | Description |
|------|------|---------------|--|
| | -141 | | |
| 1 | X | D350-748-141 | CROSSTUBE ASSEMBLY (AS 350/355 HI FWD) |
| 2 | 1 | D6015-125 | CROSSTUBE (OR D6017-115) |
| 3 | 2 | D3502-1 | SUPPORT |
| 4 | 2 | D2856-400-710 | ABRASION STRIP |
| 5 | 1 | AELS-1032-225 | INSERT |
| 6 | 1 | NAS1149D0363J | WASHER (OR AN960JD10) |
| 7 | 2 | MS21920-20 | CLAMP (PER DART SPEC. M-MS21920-20) |
| 8 | 1 | MS27039-1-10 | SCREW |

GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6015-125 OR D6017-115
FINISHED LENGTH = 110.270±0.06
- 2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: DART PART NUMBER "D350-748-141" AND BATCH NUMBER ON INSIDE OF CUFF
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 30.45 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- 9) BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- 12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE, CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.
- 14) TORQUE CLAMPS 80 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

SHOP COPY
REVISION 09
EMEND 0002
UNCONTROLLED COPY
SUBJECT TO APPROVAL
WITHOUT NOTICE
WORK ORDER
NO. 22815

UNDER REVIEW

RELEASED
2011-01-18

| | | | |
|------------|---|--|--------------|
| F | ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4) | CP | 10.11.23 |
| E | REVISE GENERAL NOTES; UPDATE TO CURRENT ADD STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); TOLERANCES (ZN C8-3, D1-3) | RF | 09.09.30 |
| D | MAG. PARTICLE AND CAD PLATE AS MFD. | CP | 06.10.31 |
| C | ADD CAD PLATING | CP | 06.08.14 |
| B | ADD D6017-115 & PRIME AND PAINT | CP | 06.06.30 |
| A | NEW ISSUE | CP | 06.03.31 |
| REV. | DESCRIPTION | BY | DATE |
| DESIGN | 90 | DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA | |
| DRAWN | 90 | | |
| CHECKED | h | DRAWING NO. | REV. F |
| MFG. APPR. | E | D350-748-141 | SHEET 1 OF 4 |
| APPROVED | H | TITLE | SCALE |
| DE APPR. | H | CROSSTUBE (AS 350/355 HI FWD) | NTS |
| DATE | 10.11.23 | COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD. | |

8 7 6 5 4 3 2 1

D

C

B

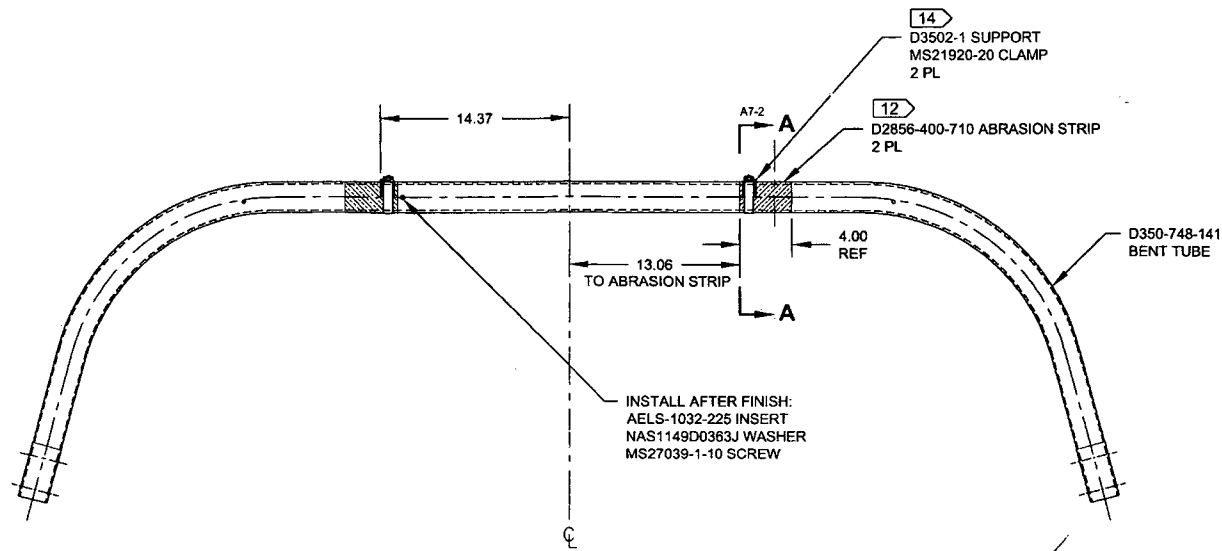
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D

C

B

A

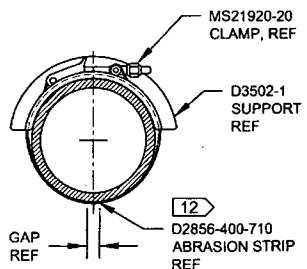


**D350-748-141
ASSEMBLY DETAIL**

72815

UNDER REVIEW
11.07.11

RELEASED
2011-01-31

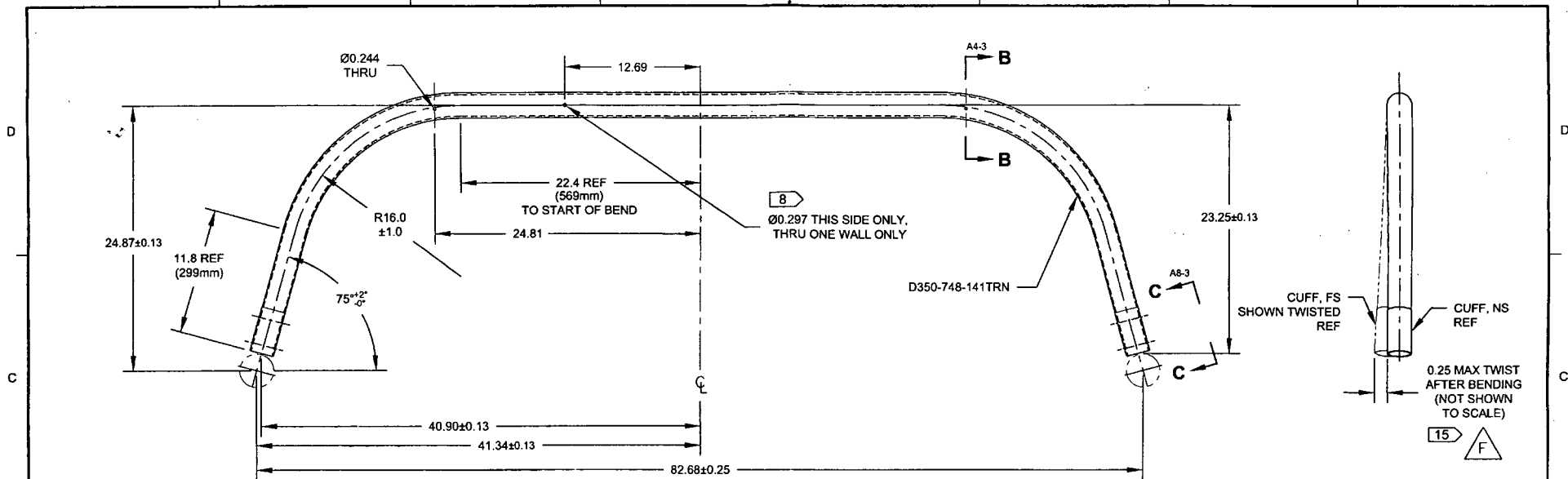


SECTION A-A D4-2
SCALE 4X

| | | | |
|------------|----------|---|--------------|
| DESIGN | | DART AEROSPACE LTD | |
| DRAWN | | HAWKESBURY, ONTARIO, CANADA | |
| CHECKED | | DRAWING NO. | REV. F |
| MEG. APPR. | | D350-748-141 | SHEET 2 OF 4 |
| APPROVED | | TITLE | SCALE |
| DE APPR. | | CROSSTUBE (AS 350/355 HI FWD) | NTS |
| DATE | 10.11.23 | <small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL. NOT BE REPRODUCED OR DISCLOSED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small> | |

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8 7 6 5 4 3 2 1

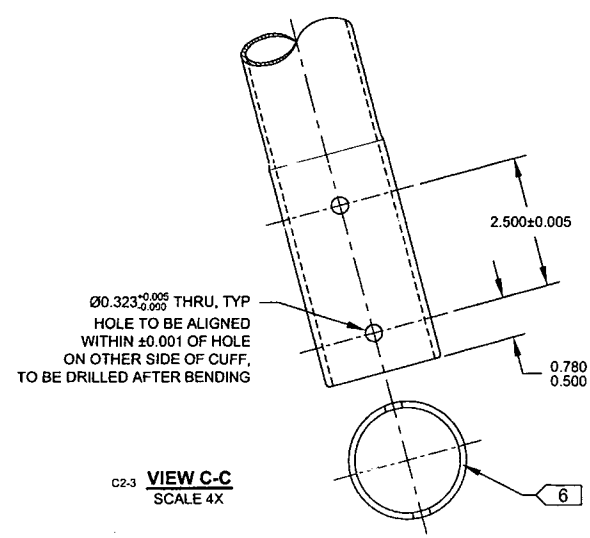


D350-748-141
BENDING AND DRILLING DETAIL 10

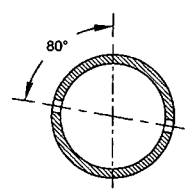
72815

UNDER REVIEW
11.27.12

RELEASED
2011-01-18



C2-3 **VIEW C-C**
SCALE 4X



SECTION B-B D3-3
SCALE 4X

| | | | |
|---|----------|--|--------------|
| DESIGN | DP | DART AEROSPACE LTD | |
| DRAWN | DP | HAWKESBURY, ONTARIO, CANADA | |
| CHECKED | B | DRAWING NO. | REV. F |
| MFG. APPR. | C | D350-748-141 | SHEET 3 OF 4 |
| APPROVED | H | TITLE | SCALE |
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8 7 6 5 4 3 2 1



VAC AERO
INTERNATIONAL INC.

RELEASE NOTE

GST No. : R105468102

OAK 133773-1



HEAD OFFICE
1371 SPEERS ROAD, OAKVILLE, ONTARIO
CANADA L6L 2X5
TEL: (905) 827-4171 FAX: (905) 827-7489



2009 WYECROFT ROAD, UNIT B
OAKVILLE, ONTARIO
CANADA L6L 6J4
TEL: (905) 827-7377 FAX: (905) 827-1380



QUEBEC DIVISION
7450 RUE VÉRITÉ STREET, ST. LAURENT, QUÉBEC
CANADA H4S 1C5
TEL: (514) 334-4240 FAX: (514) 334-6269

09/22/2011

MM/DD/YYYY

PAGE : 1

1DAR01

BILL TO:

DART AEROSPACE LTD.
1270 ABERDEEN ST.
HAWKESBURY, ON

SHIP TO: DART AEROSPACE LTD.
1270 ABERDEEN ST.
HAWKESBURY, ON

K6A 1K7

K6A 1K7

| DATE SHIPPED | SHIP VIA | F.O.B. |
|------------------|----------|-------------|
| 09/22/2011 | | ORIGIN |
| CUSTOMER P/O No. | JOB No. | TERMS |
| P014727 | | NET 30 DAYS |

| PART No. | DESCRIPTION | UOM | QTY ORD | QTY SHPD | TEST RESULTS |
|---|-----------------|-----|------------|-------------|--------------|
| D350-748 | -141 CROSS TUBE | EA | 12 | 12 | |
| <p>Process Specifications: Procedure: 4353 HEAT TREATED TO 180 KSI MIN. PER AMS 2759-1E 100% HARDNESS CHECKED AS PER ASTM E-18 40/45 HRC MATERIAL: 4130</p> <p>LINE# 70650, 1 PC LINE# 72812, 1 PC LINE# 70652, 1 PC LINE# 72813, 1 PC LINE# 72334, 1 PC LINE# 72814, 1 PC LINE# 72335, 1 PC LINE# 72815, 1 PC LINE# 72336, 1 PC LINE# 72816, 1 PC LINE# 72337, 1 PC LINE# 72817, 1 PC</p> <p><i>Sullos/26</i></p> <p>100% HARDNESS TESTED 44-12 PG 44/45 HRC 2008/11</p> <p>VALO TH 2008</p> | | | | | |

I hereby certify that the material covered by this release note has been inspected and tested and conforms to all specifications relevant thereto in accordance with the conditions of the contract / or purchase order.

ON BEHALF OF VAC AERO INTERNATIONAL INC.



METAL TREATING INSTITUTE

Authorized Q.C. Inspector



VACUUM BRAZING - HEAT TREATING - SPECIAL PROCESSING - FURNACE EQUIPMENT
TURBINE COMPONENT OVERHAUL - PLASMA AND OTHER COATINGS

Heat Treating - Welding